

AD-A103 710

ARMY ENGINEER DISTRICT NORFOLK VA
NATIONAL DAM SAFETY PROGRAM, BEDFORD LAKE DAM (INVENTORY NUMBER--ETC(U)
APR 81 B O TAKAN, J A WALSH

F/G 13/13

UNCLASSIFIED

NL

END
DATE FILMED
0-81
DTIG

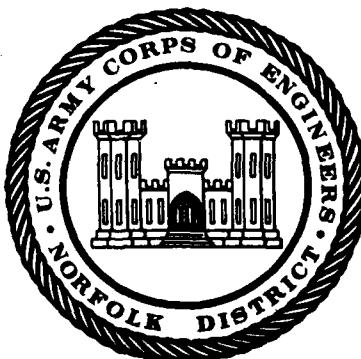
RIVER BASIN
ROANOKE
LEVEL *BS* 0-1

Name Of Dam: **BEDFORD LAKE**
Location: **BEDFORD COUNTY**
Inventory Number: **VA. 01905**

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

AD A103710

DTIC FILE COPY



DTIC
ELECTE
SEP 3 1981
S D
A

This document has been approved
for public release and sale; its
distribution is unlimited.

PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

APRIL 1981

81 9 03.047

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER VA 01905	2. GOVT ACCESSION NO. AD-A103 710	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program Bedford Lake, Bedford County, Va.		5. TYPE OF REPORT & PERIOD COVERED Final
7. AUTHOR(s) Norfolk District, Boria O. Taran		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer District, Norfolk 803 Front Street Norfolk, Virginia 23510		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE April 1981
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		13. NUMBER OF PAGES
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dams - VA National Dam Safety Program Phase I Dam Safety Dam Inspection		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) (See reverse side)		

20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

ROANOKE RIVER BASIN

NAME OF DAM: BEDFORD LAKE DAM
LOCATION: BEDFORD COUNTY, VIRGINIA
INVENTORY NUMBER: VA 01905

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Bedford Lake Dam (Inventory Number VA-01905).
Roanoke River Basin, Bedford County, Virginia.
Phase 1 Inspection Report.

PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

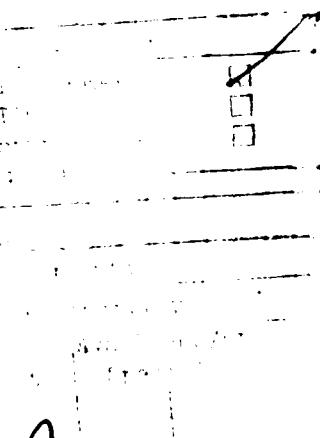
APR 1981

This document has been approved
for public release and sale; its
distribution is unlimited.

111030

TABLE OF CONTENTS

Preface	1
Brief Assessment of Dam	ii
Overview of Dam	
Section 1: PROJECT INFORMATION	1-1
Section 2: ENGINEERING DATA	2-1
Section 3: VISUAL INSPECTION	3-1
Section 4: OPERATIONAL PROCEDURES	4-1
Section 5: HYDRAULIC/HYDROLOGIC DATA	5-1
Section 6: DAM STABILITY	6-1
Section 7: ASSESSMENT/REMEDIAL MEASURES	7-1
Appendix I: Maps and Drawings	
Appendix II: Photographs	
Appendix III: Field Observations	
Appendix IV: Previous Inspection Report	
Appendix V: References	



PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF DAM

Name of Dam: Bedford Lake Dam
State: Virginia
Location: Bedford County
USGS Quad Sheet: Sedalia, Virginia
Stream: Overstreet Creek
Date of Inspection: 1 April 1981

Bedford Lake Dam is an earthfill structure approximately 700 feet long and 52 feet high. The dam is owned and maintained by Mr. James A. Burks and Mr. Marshall Burks of Bedford, Virginia. The dam is classified as an intermediate size with a significant hazard classification. The spillway is a concrete weir approximately 120 feet long and located between the embankment and the left abutment. The reservoir is used for recreation.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 1/2 PMF. The spillway will pass 16 percent of the PMF or 32 percent of the SDF without overtopping the crest of the dam. During the SDF the crest of the dam will be overtopped by 4.4 feet for 4 hours and reach an average critical velocity of 9.7 feet per second. Overtopping is considered detrimental to the embankment of the dam. However, a dam failure would not significantly increase the hazard to loss of life downstream from the dam over that which would exist just before overtopping failure. The spillway is adjudged as inadequate but not seriously inadequate.

The visual inspection revealed no apparent problems and there is no immediate need for remedial measures. However, it is recommended that within 12 months the deficiencies noted in Section 7.2 be corrected.

Submitted By:

Approved:

Original signed by:
Carl S. Anderson, Jr.

Original signed by:
Douglas L. Haller

for JAMES A. WALSH, P. E.
Chief, Design Branch

DOUGLAS L. HALLER
Colonel Corps of Engineers
District Engineer

Recommended By

Date: JUN 30 1981

Original signed by
JACK G. STARR

JACK G. STARR
Chief, Engineering Division



CREST



RESERVOIR AREA

OVERALL VIEWS - BEDFORD LAKE DAM
1 APRIL 1981

SECTION 1

PROJECT INFORMATION

1.1 GENERAL:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a National Program of Safety Inspections of Dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Reference 1, Appendix V). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: Bedford Lake Dam is an earthfill structure approximately 700 feet long and 52 feet high. The crest of the dam is 17 feet wide at elevation 1003.0 ft. msl. The upstream slope is 3.4 horizontal to 1 vertical (3.4H:V) with a bench at elevation 992.0 ft. msl. Riprap is placed on the upstream slope to elevation 999.0. The downstream slope is (2.3H:V) with a bench at elevation 985.7 msl.

It is not known whether the dam is keyed into the foundation by a core trench. It is unknown if there are any foundation drains. No foundation drain outlets were found during the inspection.

The spillway is a concrete weir 120 feet long located between the embankment and the left abutment. Seven concrete piers supporting a walkway over the spillway are spaced across the crest of the spillway. The crest of the spillway, elevation 993.0 msl, controls normal pool. The discharge channel is in natural rock with a concrete retaining wall on the right side of the spillway and a stone masonry wall on the left side. Two small tile drains are located at the end of the discharge channel before the channel drops to the downstream channel.

A 36-inch square drawdown sluice gate is located in a concrete intake structure located upstream of the embankment. A concrete box culvert 6 feet by 6 feet allows flows through the dam to discharge into a stilling basin at the toe of the dam.

1.2.2 Location: Bedford Lake Dam is located approximately 0.5 miles northwest of Colton's Mill, Virginia, at the headwaters of the North Otter Creek.

1.2.3 Size Classification: The dam classified as an intermediate size based on the height of the structure exceeding 50 feet (52 feet).

1.2.4 Hazard Classification: The dam is located upstream of 3 homes and a State Route 122. There is a potential for destruction of property and disruption of traffic; therefore, a significant hazard is assigned to the dam as defined in Reference 1 of Appendix V. The hazard classification used to categorize dams are a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: Mr. James A. Burks and Mr. Marshall Burks of Bedford, Virginia.

1.2.6 Purpose: Recreation.

1.2.7 Design and Construction History: The dam was constructed in 1935 by the Civilian Conservation Corps (CCC). The walkway across the spillway was replaced recently by the present owners.

1.2.8 Normal Operational Procedures: Operation of the dam is automatic. Water flows over the crest of the spillway as the reservoir rises above elevation 993.

1.3 Pertinent Data:

1.3.1 Drainage Area: The dam controls a drainage area of 13.24 square miles.

1.3.2 Discharge at Dam Site: Maximum flood -unknown.

Pool level at crest of dam.

Spillway 11384 cfs

TABLE 1-1 DAM AND RESERVOIR DATA

Item	Elevation feet msl	Area Acres	Reservoir Capacity		Length, feet
			Acre feet	Watershed, Inches	
Crest of Dike	1003	42.0	965	1.37	2900
Crest of Spillway	993	28.5	612	0.87	2350
Streambed at Down stream toe of dam	951+	-	-	-	-

SECTION 2
ENGINEERING DATA

2.1 Design and Construction Records: There were no design plans, construction records or as-built plans available for analysis during the preparation of this report.

2.2 Evaluation: There is insufficient information to evaluate the foundation condition and the embankment stability.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

3.1.1 General: The field inspection was conducted on April 1, 1981. The weather was clear and dry with a temperature in the low seventies. Ground surface conditions along the embankment were generally dry. At the time of the inspection the pool elevation was at 993.3 msl and the tailwater elevation was approximately 952.6 msl. Overall the dam and appurtenant structures were found to be in good condition. However, several deficiencies were found necessitating remedial treatment. A field sketch of the conditions observed during the inspection is located in Appendix I. Prior to the present owners purchase of the dam, an inspection and evaluation was performed by the firm of Hurt and Profitt Engineers-Surveyors, Lynchburg, Virginia. At their recommendation the bridge spanning the emergency spillway was replaced and remedial work was done to the ogee weir at the entrance to the emergency spillway channel.

3.1.2 Dam: The embankment was found to be in overall good condition. No signs of surface cracks were found along the dam during the inspection. There was no cracking noted at or beyond the embankment toe. No serious erosion or sloughing of the embankment slopes was found. Numerous small animal burrows were noted along both the upstream and downstream slope. Several tree stumps were noted along the embankment slopes. Several areas of sparse vegetation exist on the embankment since the dam had been recently burned over. From the visual inspection the vertical and horizontal alignment appear good. Stable rock riprap was observed along the upstream slope extending from approximately 4.0 feet below the crest to a bench at the pool level. The inspection team was informed, by the present owner, that the riprap blanket extends down to the toe of the upstream embankment. There was no evidence of internal drains found during the inspection. A small seep flowing clear water was at the interface of the downstream embankment toe and the left side of the concrete headwall at the principal spillways outlet. The temperature of the flow was 58° which coincides with the reservoir surface temperature. Vegetative cover on the dam consist of grass, weeds and shrubs. Surface soils from the embankment indicated a mixture of residual decomposed rock consisting of fine to coarse sand and red clayey silt which are predominant in the immediate area.

3.1.3 Appurtenant Structures: The appurtenant structures appear in overall good condition. An emergency spillway, approximately 120 feet. in width is cut into natural ground at the left abutment. The control section is a concrete (ogee) weir spanning the width of the spillway channel. Remedial work was done on a portion of the weir to correct and prevent further undermining of the weir slab. The approach channel is shallow with little debris and is bordered by a concrete wall on the right side and a combination concrete and cemented rockwall on the left side. The channel bottom appears to be lined with a mixture of grouted rock and vegetation. The grouted rock is highly deteriorated. Numerous small springs were observed flowing from the bottom of the spillway channel along the left side.

The springs were flowing clear with temperatures of 58° F which coincided with the temperature of the reservoir surface. The discharge channel is located on natural rock at the end of the channel walls. A concrete weir is located at the discharge point just before the point where the outflow drops approximately 15.0 feet to the streambed below the dam. Two drainhole approximately 8 inch by 8 inch are built into the concrete weir. Outflow is approximately 60 gpm on the right drain. No flow was observed coming from the left drain. A drawdown inlet structure located in the reservoir, was inaccessible to the inspection team. However, it was observed from the shoreline to consist a concrete platform and an access ladder. The drawdown outlet is a 6.0 foot square concrete box culvert tunnel extending at low level through the dam. A 36 inch square slide gate is located at the bottom of a concrete platform located in the reservoir. A flow of approximately 4 gpm was observed leaking through the gate seal. The drawdown exits into a riprap lined plunge pool before the flowing downstream. There is insignificant erosion around the plunge pool, but not enough to be of any consequence.

3.1.4 Reservoir Area: The reservoir slopes are mild and vary from heavily wooded to rock outcrops. A gentle sloped area in the upper left portion of the reservoir is used for recreation. The upper portion of the watershed is heavily wooded and relatively steep. The inspection team was unable to evaluate sedimentation in the reservoir.

3.1.5 Downstream Channel: The downstream area is well defined with little debris or obstructions. However, trees line the channel and would obstruct flows during flooding conditions. The left bank below the dam is very steep and wooded while the right bank is mild and changes into very gentle pasture land about 1000 feet below the discharge channel of the spillway. There are three homes approximately 1/3 of a mile downstream of the dam before the stream flows under State Route 122.

3.1.6 Instrumentation: There is no instrumentation on the dam.

3.2 Evaluation: Overall the dam and appurtenant structures appear in good condition. No evidence of instability was observed in either the dam or the foundation. There appears to be a good maintenance program to control vegetation on the dam however, it is recommended that the areas of no vegetation or sparse vegetation observed during the inspection be seeded to inhibit possible erosion. The animal burrows noted should also be backfilled and seeded. The tree stumps noted in the embankments should be removed in their entirety and the cavities backfilled and seeded, due to there eventual decay and subsequent potential for piping. The seep noted at the drawdown outlet headwall should be monitored for increase in flow and/or turbidity. The source of the seeps in the emergency spillway channel are unknown but may be attributed to the malfunctioning drainhole backing up entrapped water under the deteriorated cemented rock of the channel bottom. These seeps should also be monitored for turbidity and/or increase in flow. If these conditions develop, a qualified geotechnical engineer should be contacted to evaluate the situation. In addition to the above measures a staff gage should be installed to monitor reservoir levels above normal pool.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures: The normal storage pool is 993 ft. msl, which is the crest of the spillway. The reservoir provides recreation. Water passes automatically over the spillway as the reservoir rises above elevation 993. A 36-inch square sluice gate located at the bottom of a concrete intake structure in the reservoir is available to drawdown the reservoir.

4.2 Maintenance: There is no regular maintenance program for Bedford Lake Dam. The owner performs maintenance on an as needed basis.

4.3 Warning System: At present time, there is no warning system or evacuation plan for Bedford Lake Dam.

4.4 Evaluation: The dam does not require an elaborate operational and maintenance program. However, regular maintenance program, complete with documentation, should be developed. An emergency operation and warning plan should be developed. It is recommended that a formal emergency procedure be prepared and furnished to all operating personnel. This should include:

a. How to operate the dam during an emergency.

b. Who to notify, including public officials, in case evacuation from the downstream area is necessary.

SECTION 5

HYDRAULIC/HYDROLOGIC DATA

5.1 Design: None were available.

5.2 Hydrologic Information: None were available.

5.3 Flood Experience: The maximum flow at the dam site is not known.

5.4 Flood Potential: The 100-year flood, 1/2 PMF and PMF were developed and routed through the reservoir by use of the HEC-1DB computer program (Reference 2, Appendix V) and appropriate unit hydrograph, precipitation and storage-outflow data. Clark's Tc and R coefficient for the local drainage area were estimated from basin characteristics. The rainfall applied to the developed unit hydrograph was obtained from the U. S. Weather Bureau Publication (Reference 3, Appendix V).

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1.

Water passes automatically over the spillway as the reservoir rises above the elevation 993.

The storage curve was developed based on areas obtained from a U. S. Geological Survey Quadrangle Map. Survey data taken during the inspection was correlated to the Sedalia, Virginia, Quadrangle Map to help develop area-storage data. Rating curves for the spillway and non overflow sections were developed. In routing hydrographs through the reservoir, it was assumed that the initial pool level was at the spillway crest (elevation 993).

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance is shown in the following table:

Table 5.1 RESERVOIR PERFORMANCE

Item	Normal Flow	100 1/ Year	1/2 PMF	PMF 2/
Peak flow c.f.s.				
Inflow	13	12967	35709	71418
Outflow	13	12836	35088	70890
Maximum elevation ft. msl	993+	1003.42	1007.44	1012.15
Non-overflow section (elevation 1003)				
Depth of flow, ft.	-	0.42	4.44	9.15
Duration, hrs.	-	0.5	4.0	6.5
Velocity, fps 3/	-	3.0	9.7	13.9
Tailwater elevation ft. msl	-	-	-	-
	952.6+	-	-	-

1/ The 100-Year Flood has one chance in 100 of occurring in any given year.

2/ The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

3/ Critical Velocity

5.7 Reservoir Emptying Potential: A 36-inch square sluice gate with an approximate invert elevation 953 is available to dewater the reservoir. The low level outlet will permit a withdrawal of about 264 cfs with the reservoir at the crest of the spillway (elevation 993) and essentially dewater the reservoir in approximately 2.5 days. This is equivalent to an approximate drawdown rate of 16 feet per day based on the hydraulic height measured from normal pool divided by the time to dewater the reservoir.

5.8 Evaluation: Based on the size (intermediate) and hazard classification (significant) the recommended Spillway Design Flood is the 1/2 PMF to the PMF. Because of the risk involved, the 1/2 PMF has been selected as the SDF. During the SDF the crest of the dam will be overtopped by 4.4 feet for 4 hours and reach an average critical velocity of 9.7 feet per second.

Conclusions pertain to present day conditions and the effect of future development on the hydrology has not been considered.

SECTION 6

DAM STABILITY

6.1 Foundation and Abutments: The dam is located in the Blue Ridge physiographic province of Virginia. Generally, the area geology consists of shallow residual soils overlying massive greenish-grey bedrock. Rocks of the Virginia Blue Ridge Complex are shown on the Geologic Map of Virginia as underlying the dam. This complex is Precambrian in age and consists predominantly of granite and gneiss. It is unknown if the dam has a foundation drainage system. There are no drain outlets. It is also unknown if the dam is keyed into the foundation. The predominate foundation materials are considered relatively impervious and stable.

6.2 Embankment:

6.2.1 Materials: There is no information available on the nature of the embankment materials, however it is suspected that the source of the borrow is located in the immediate vicinity of the dam. The area soils range from silty sands to high plastic clayey silts which is consistent with the surface material found on the dam embankment.

6.2.2 Stability: There are no available stability calculations. The dam is approximately 52.0 feet high with a crest width of 17.0 feet. A dirt road traverses the crest of the dam. The upstream and downstream slopes are 3.4H:1V and 2.3H:1V respectively. The normal pool is at the crest of the emergency spillway at an elevation of 993.0 msl. There is approximately 10.0 feet of freeboard from the normal pool to the crest of the dam. The dam will be subject to rapid drawdown due to the low level principal spillway drain which can drawdown the dam at a rate exceeding the critical rate of 0.5 ft/day.

6.2.3 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: There is insufficient information to adequately evaluate the stability of the dam. However, the visual inspection revealed no apparent instability. Based on the visual inspection, the foundation is considered sound. The embankment is considered stable during normal pool (i.e. maximum storage pool) operations. Overtopping is considered detrimental to the dam during a SDF flood the dam will be overtopped by 4.4 feet of water for a duration of 4 hours at an average critical velocity of 9.7 feet per second. The critical velocity of 9.7 feet per second is greater than the effective eroding velocity, 6 feet per second, for a vegetated earth embankment. It is not known whether the dam has ever been subjected to rapid drawdown. A stability analysis is not required because the dam appears well constructed and the visual inspection revealed no apparent problems.

SECTION 7

ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: The available engineering data is insufficient to evaluate the embankment stability. However, the visual inspection revealed no findings to prove the dam unsound. Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 1/2 PMF. The spillways will pass 16 percent of the percent of the PMF or 32 percent of the SDF without overtopping the crest of the dam. Flows overtopping the crest of the dam during the SDF are considered detrimental to the dam. However, a dam failure would not significantly increase the hazard to loss of life downstream from the dam over that would exist just before overtopping failure. The spillways are considered inadequate but not seriously inadequate. Overall the dam is in good condition and there is no immediate need for remedial measures. A stability check of the dam is not required.

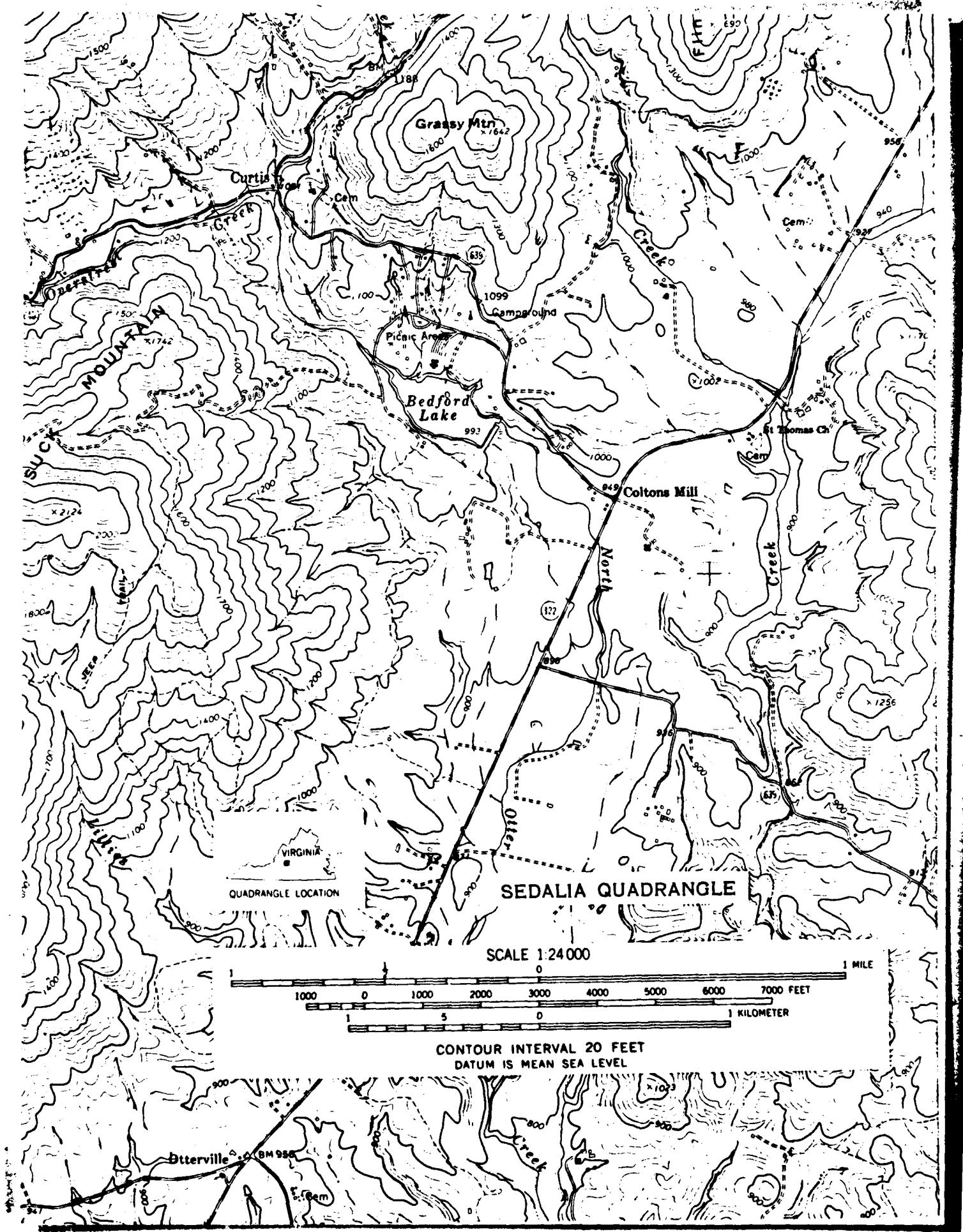
7.2 Recommended Remedial Measures: It is recommended that the regular maintenance operation program be instituted and documented for future reference. A formal emergency procedure should be prepared, and furnished to all operating personnel. This should include how to operate the dam during an emergency, and who to notify, including public officials, in case evacuation from the downstream area is necessary. Also, the inspection revealed the following maintenance items that should be scheduled by the owner during a regular maintenance period within the next 12 months:

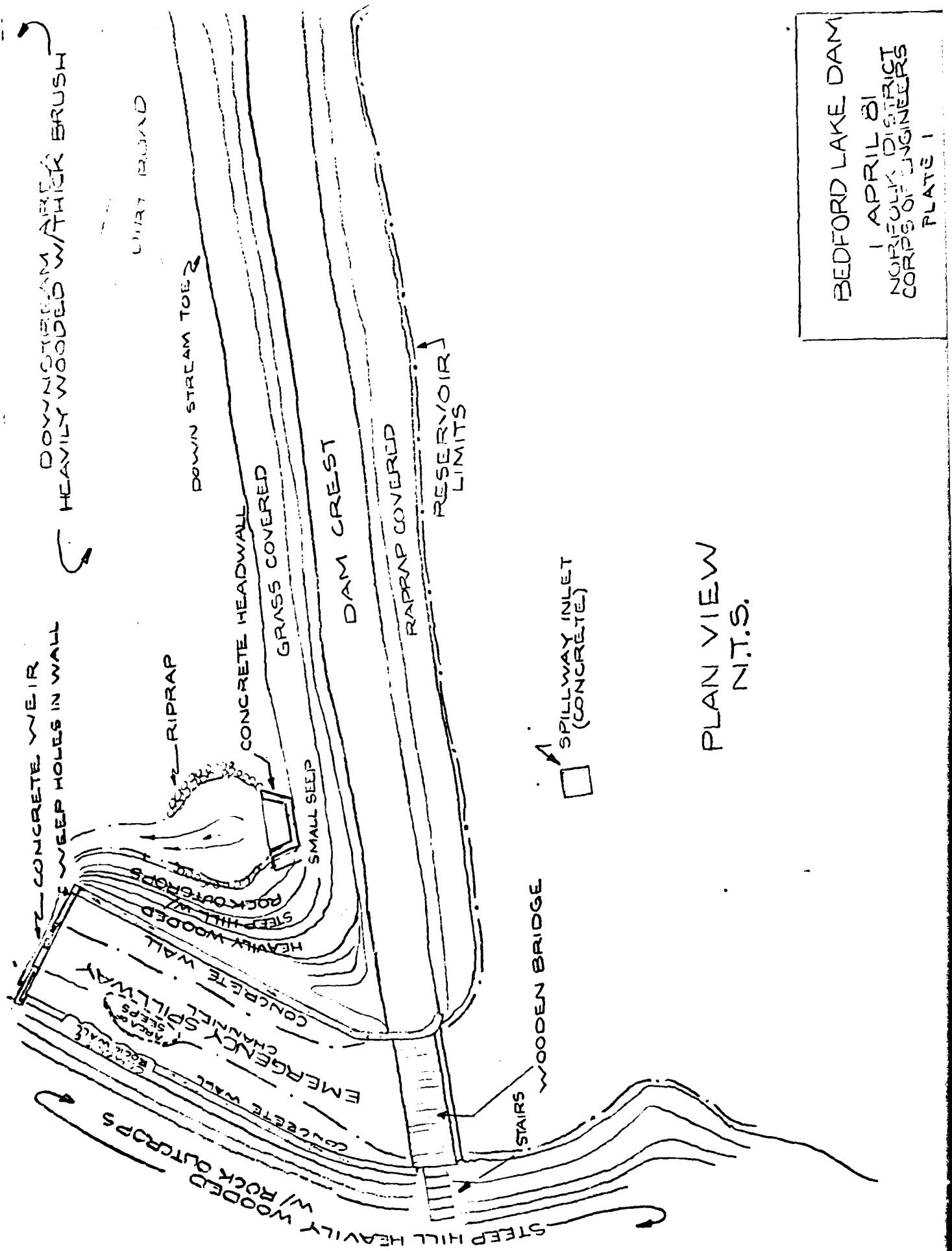
- a. The areas with no vegetation or sparse vegetation should be seeded to inhibit future erosion.
- b. The animal burrows located on the embankments should be backfilled with a compacted fill and seeded.
- c. The tree stumps noted in the embankment should be removed in their entirity, backfilled with a compacted fill and seeded.
- d. The seep noted at the principal spillway headwall should be monitored for increase in flow and/or turbidity.
- e. The springs noted in the emergency spillway should be monitored for increase in flow and/or turbidity.
- f. A staff gage should be installed to monitor reservoir levels above normal pool.

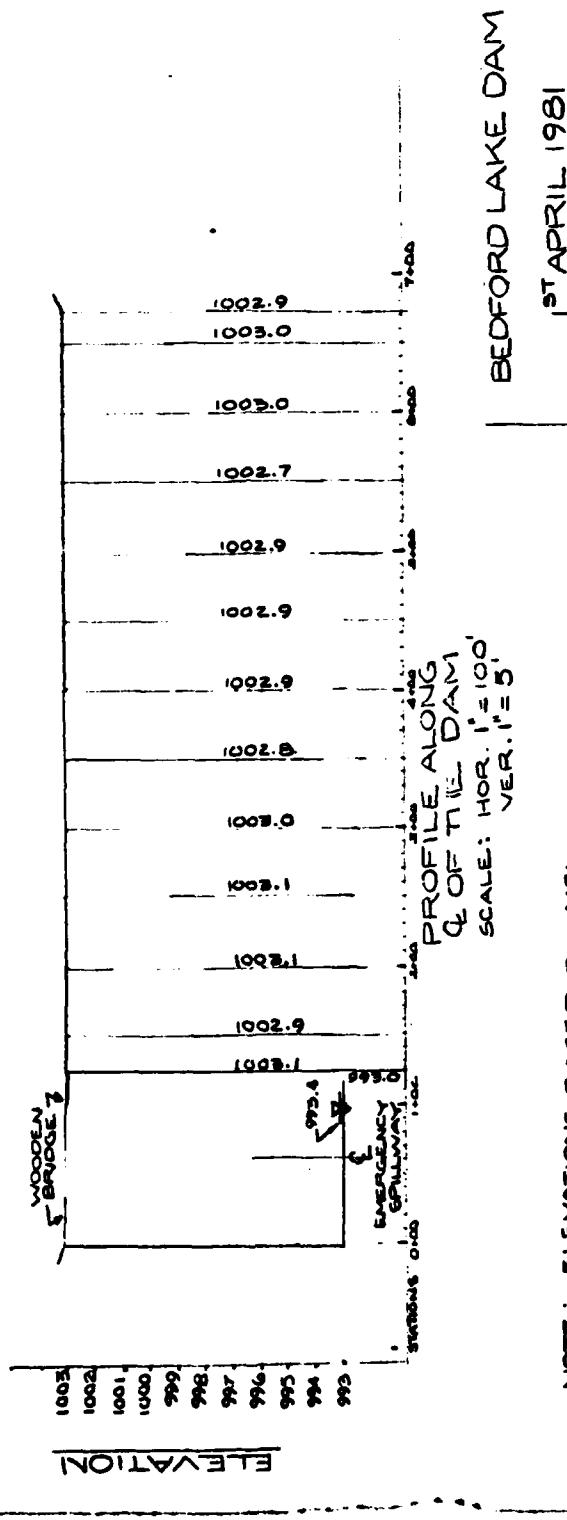
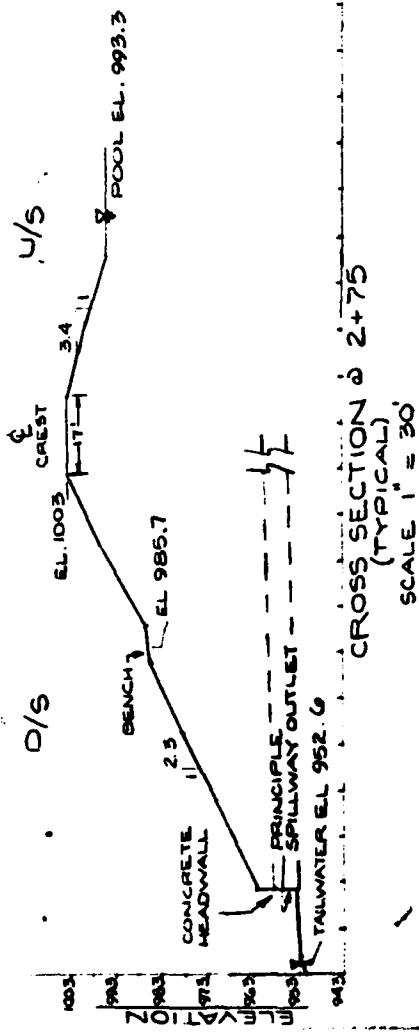
g. The shrubs and saplings on the embankment should be cut off at ground level.

h. A staffgage should be installed in the reservoir to extend above the crest of the dam.

APPENDIX I
MAPS AND DRAWINGS







NOTE: ELEVATIONS BASED ON MSL

NORFOLK DISTRICT CORPS
OF ENGINEERS

NORFOLK DISTRICT CORPS
OF ENGINEERS

SEAGATE DISTRICT COURT

DÍA
X

100

APPENDIX II
PHOTOGRAPHS



PHOTO #1 CREST



PHOTO #2 UPSTREAM FACE



PHOTO #3 DOWNSTREAM FACE
(NOTE BENCH CENTER LEFT)

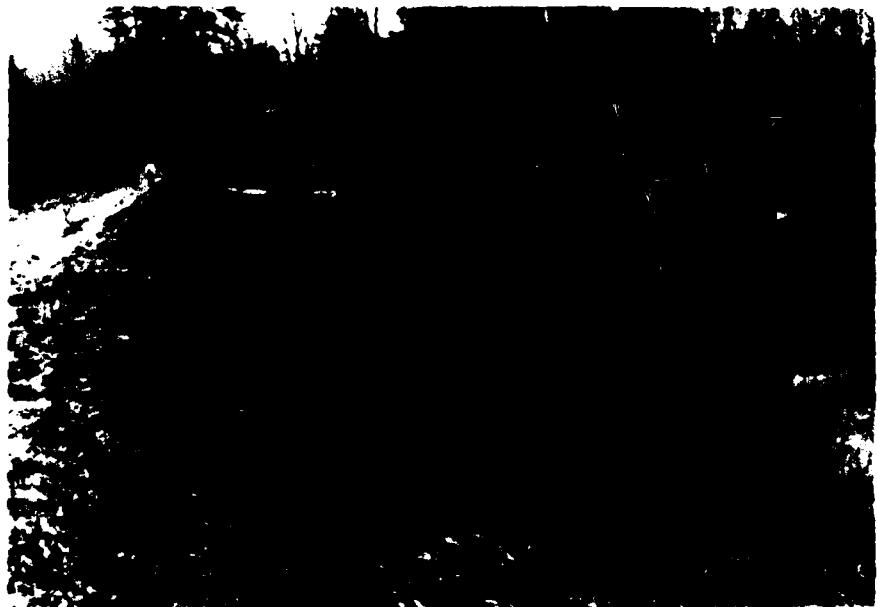


PHOTO #4 DOWNSTREAM FACE



PHOTO #5 RESERVOIR DRAIN



PHOTO #6 RESERVOIR DRAIN OUTLET
(6ft. x 6ft. CONC. BOX CULV.)



PHOTO #7 SPILLWAY CONTROL SECTION



PHOTO #8 SPILLWAY (COBBLE STONE LINED)



PHOTO #9
SPILLWAY WEEP

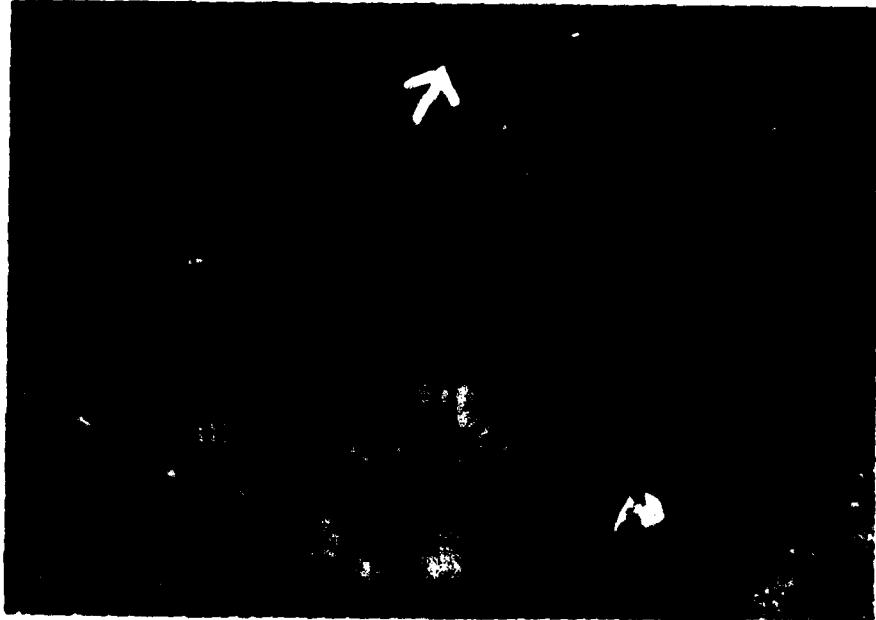


PHOTO #10 DOWNSTREAM AREA (NOTE
CONFLUENCE RESERVOIR DRAIN
CHANNEL & SPILLWAY
DISCHARGE CHANNEL

APPENDIX III
FIELD OBSERVATIONS

Check List
Visual Inspection
Phase I

Name Dam: Bedford Lake Country: Bedford State: Virginia Coordinates: Lat. 3728.0
Long. 7928.3

Date Inspection: 01 April 1981 Weather: Clear & Mild Temperature: 65° - 75° F

Pool Elevation at Time of Inspection: 993.3± ft. msl Tailwater at Time of Inspection: 952.6± ft. msl

Inspection Personnel:

M. Byrne, COE
J. Robinson, COE
L. Jones, COE

B. Taran, COE
L. Musselwhite, SWCB
SWCB

Mr. J. Burks, Owner

Byrne & Robinson Recorders

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	There are no signs of surface cracks on the embankment.	None.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	No unusual movement or cracking is noted at or beyond the embankment toe.	None.
SLOUCHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	No major sloughing or erosion of embankment or abutment slopes is noted. However, numerous animal burrows are noted on both the U/S and D/S embankment slopes. A few bare spots exist on the embankment slopes.	The animal burro's should be backfilled and seeded. The bare spots should be seeded.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The vertical and horizontal alignment of the dam appear to be good.	None.
RIPRAP FAILURES	The upstream embankment slope is covered with rock riprap to within 6.0 feet of the crest. No failure are evident and the riprap appears stable.	None.

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
EMBANKMENT			
FOUNDATION	The foundation appears stable with no noticeable defects.	None.	
ANY NOTICEABLE SEEPAGE	A small clear seep is noted at the interface of the downstream embankment toe and the left side of the concrete headwall at the principal spillway outlet point. Several clear flowing springs are noted exiting from the bottom of the emergency spillway channel along the left side.	The seeps should be monitored for increase in size and/or turbidity if the above conditions develop a qualified geotechnical engineer should be contacted to evaluate the situation.	
DRAINS	No evidence of internal drains were observed during the inspection.	None.	
MATERIALS	Surface soils in the area range from silty sands (SM) to clayey silts (MH) surface samples taken from the embankment indicate decomposed rock consisting of fine to coarse sand (SM) and red clayey silt ML-MH of low plasticity. The ground surface of the embankment and abutments are generally dry.	None.	
VEGETATION	The dam is covered with grass, weeds and low lying shrubbery. Several tree stumps are noted on the embankment face.	The tree stumps and root system should be removed in their entirety and the area should be backfilled and seeded.	

SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTIONS	The control section is 120 feet long concrete weir (ogee shaped) located between the left abutment and the earthen embankment.	None.
APPROACH CHANNEL	The approach channel is shallow with little debris. The lake bottom is sandy and rock lined.	None.
DISCHARGE CHANNEL	The discharge channel is lined with a concrete wall on the right and a stone wall on the left. The channel is natural rock with some mortar work in the lower right portion of the channel before it drops about 15 feet to the streambed below the dam. About 20 small boils are located in the left portion of the channel. The drain on the right side of the channel is flowing at least 60 gpm while the one on the left is not flowing at all.	None.
BRIDGE AND PIERS	Seven equally spaced concrete piers about 1 foot thick hold up the walkway from the left abutment to the earthen embankment.	None.
EMERGENCY GATE	A 36-inch square slide gate is located about 70 feet upstream of the earthen embankment. A concrete platform with access ladder was observed from the shoreline. A leak of about 4 gpm was measured inside the tunnel around the seal of the gate.	None.

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATION
MONUMENTATION/SURVEYS	None.	None.
OBSERVATION WELLS	None.	None.
WEIRS	None.	None.
PIEZOMETERS	None.	None.
STAFFGAGES	None.	A staffgage should be placed in the reservoir to monitor flood elevations.

RESERVOIR

VISUAL EXAMINATION **OBSERVATIONS** **REMARKS OR RECOMMENDATIONS**

SLOPES

The reservoir slopes are mild with a large portion heavily wooded. A gentle sloped area in the upper left portion of the reservoir is used for picnickers and campers.

None.

SEDIMENTATION

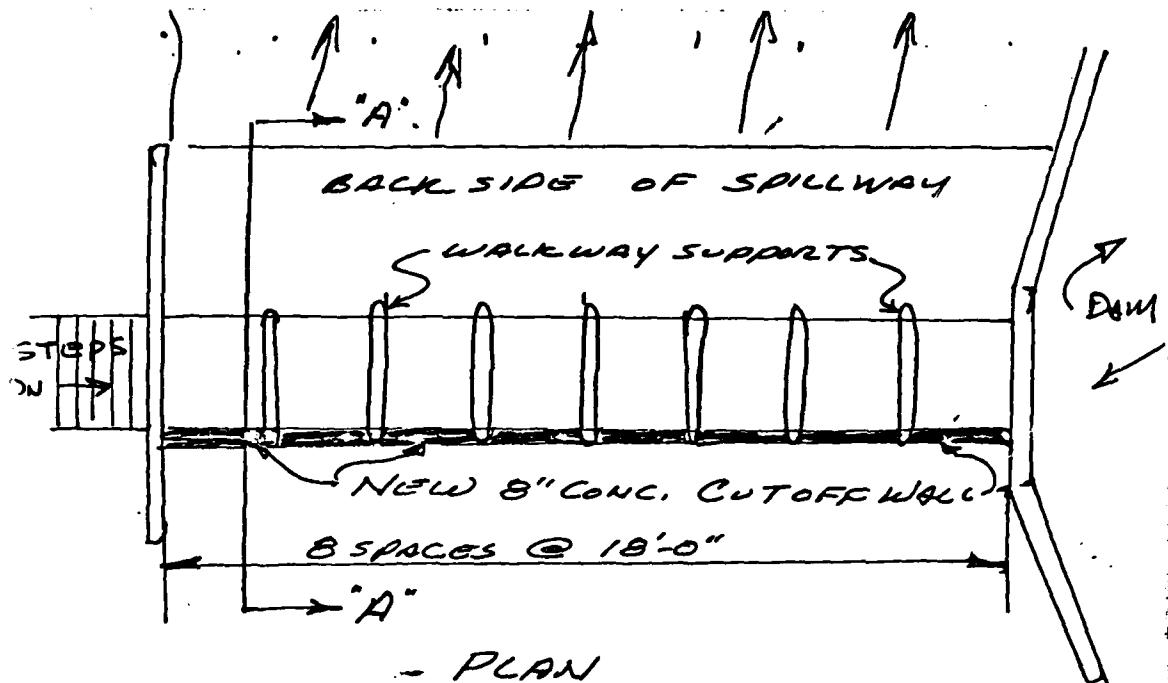
The inspection team was unable to evaluate sedimentation in the reservoir.

None.

DOWNSTREAM CHANNEL

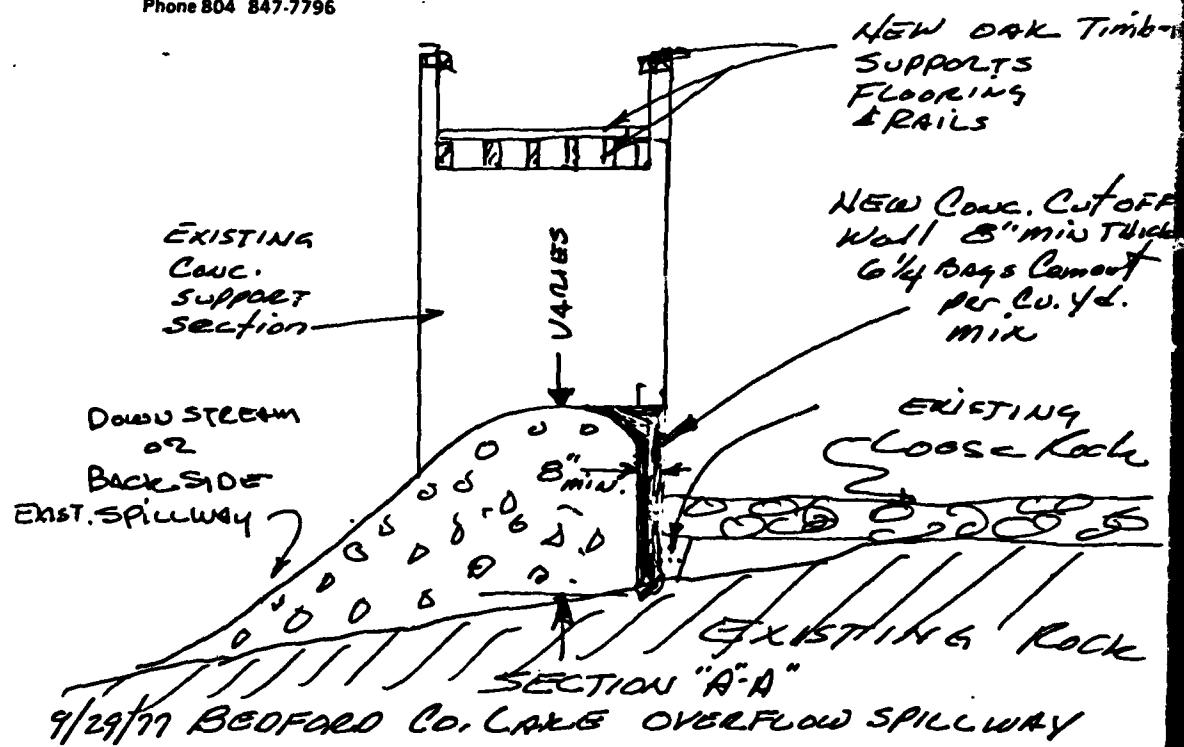
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream area was well defined with little debris or obstructions observed. Trees line the channel and would obstruct flows during flooding conditions.	None.
SLOPES	The left bank below the dam is steep & wooded, while the right bank is very gentle pasture land about 1000 feet below the discharge channel of the spillway.	None.
APPROXIMATE NO. OF HOMES AND POPULATION	There are 3 homes about 1 1/3 miles downstream of the dam before the stream flows under State Route 122.	None.

APPENDIX IV
PREVIOUS INSPECTION REPORT



- PLAN

HURT & PROFFITT, INC. **OVERFLOW**
 Engineers - Surveyors
 P.O. Box 1054 Lynchburg, Va. 24505
 Phone 804 847-7796



APPENDIX V

REFERENCE

REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Office of the Chief of Engineers, Department of the Army, Washington, D. C.
2. HEC-1DB Flood Hydrograph Package, (Hydrologic Engineering Center, U. S. Army Corps of Engineers, September 1978.)
3. "Probable Maximum Precipitation Estimates, United States East of the 105th Meridian," Hydrometeorological Report No. 51, (U. S. Weather Bureau, June 1978).
4. "Rainfall Frequency Atlas of the United States", Technical Paper No. 40, (U.S. Weather Bureau, May 1961).
5. "Design of Small Dams", Technical Publication of United States Department of the Interior, Bureau of Reclamation, Second Edition, Revised Reprint, 1977.